Co-funded by
the European Union

Human Brain Project

High Performance Analytics & Computing Platform

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Forschungszentrum Jülich, Germany

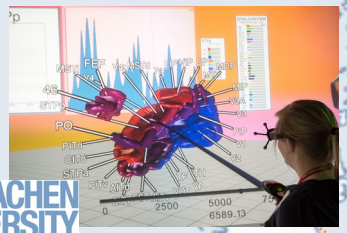
November 11, 2016

The High Performance Analytics & Computing Platform

Builds, integrates and operates the hardware and software components of the supercomputing, data and visualization infrastructure required to

- Run large-scale, data intensive, interactive brain simulations up to the size of a full human brain,
- Manage the large amounts of data used and produced by the simulations, and
- Manage complex workflows comprising concurrent simulation, data analysis and visualization workloads.

Federated infrastructure across Europe

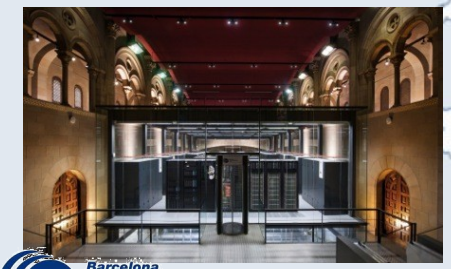


RWTH AACHEN UNIVERSITY

JÜLICH FORSCHUNGSZENTRUM

HBP Cloud Storage

KIT Karlsruhe Institute of Technology



BSC Barcelona Supercomputing Center
Centro Nacional de Supercomputación

CSCS
Centro Svizzero di Calcolo Scientifico
Swiss National Supercomputing Centre

EPFL ECOLE POLYTECHNIQUE FEDERALE DE LAUSANNE

CINECA

Integration of HPC systems

- Large variety of architectures suitable for data analytics and image processing workflows

Piz Daint

- Cray XC30
- 7.787 Pflops peak performance
- 5.272 nodes
- 64-bit Intel SandyBridge processors
- NVIDIA Tesla K20X GPUs

JURECA

- T-Platforms V-Class
- 1.8 (CPU) + 0.44 (GPU) Petaflops peak perf.
- 1.872 nodes
- Intel Xeon E5-2680 v3 Haswell processors
- NVIDIA K80 GPUs
- Up to 0.5 TB/node

Pico

- Linux Infiniband Cluster
- 74 nodes, 1080 cores
- Different node types, e.g. up to 1TB memory per node, dedicated to visualisation, some with GPUs

Federated Supercomputing

PRACE network

JUQUEEN & JURECA

JÜLICH FORSCHUNGSZENTRUM

MareNostrum

BSC Barcelona Supercomputing Center Centro Nacional de Supercomputación

Fermi & Pico

BlueBrain 4/Piz Daint

CSCS Centro Svizzero di Calcolo Scientifico Swiss National Supercomputing Centre

dedicated

Internet

dedicated

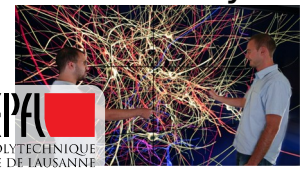
HBP High Fidelity Visualisation Systems

RWTH AACHEN UNIVERSITY

HBP Cloud Storage

KIT Karlsruhe Institute of Technology

HBP High Fidelity Visualisation Systems



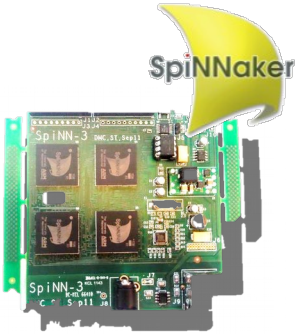
EPFL ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Future Architectures for the HBP

HPAC Platform – a use case

Run a **simulation** of the microcircuit model on **JUQUEEN using NEST**

Run a **simulation** of the microcircuit model on **SpiNNaker**



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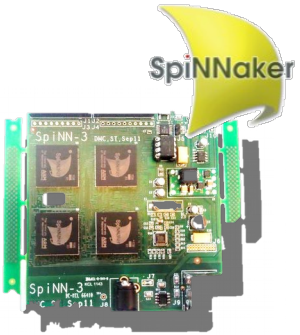

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elephant
ELECTROPHYSIOLOGY ANALYSIS TOOLKIT

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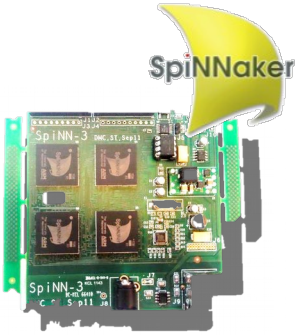

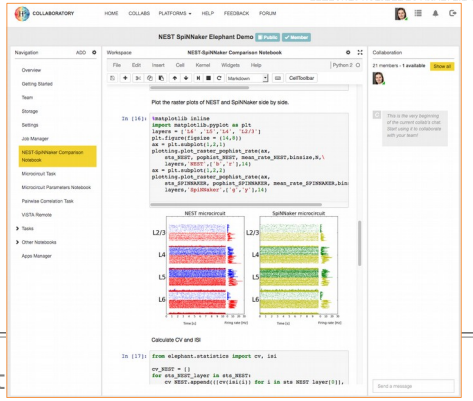

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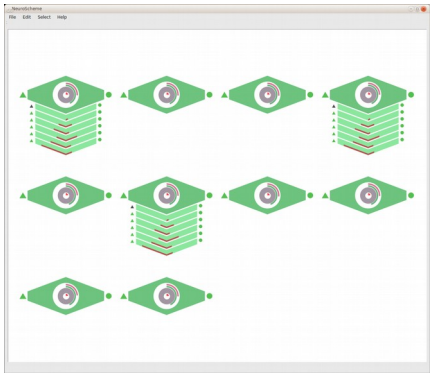

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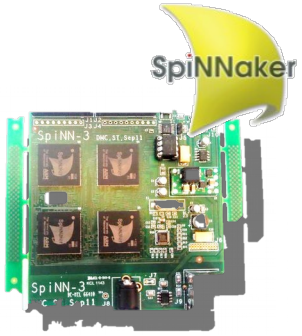

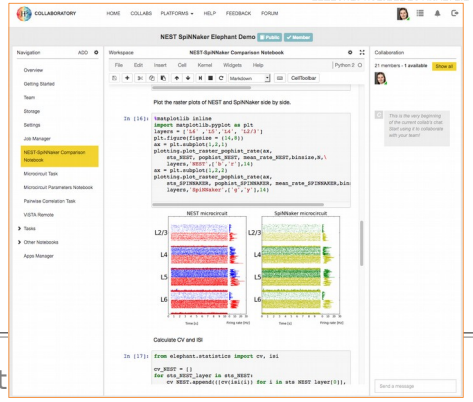

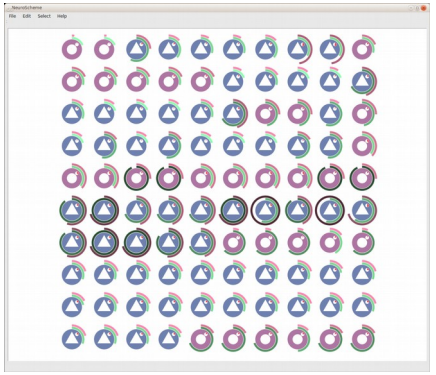

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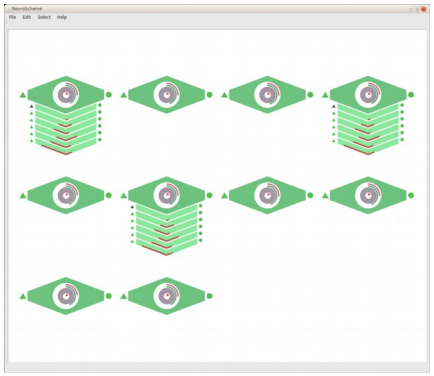

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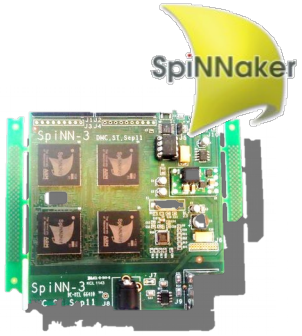

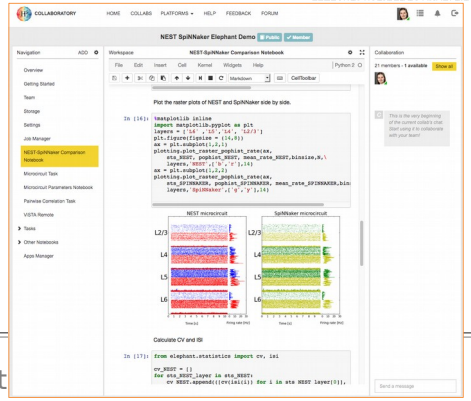

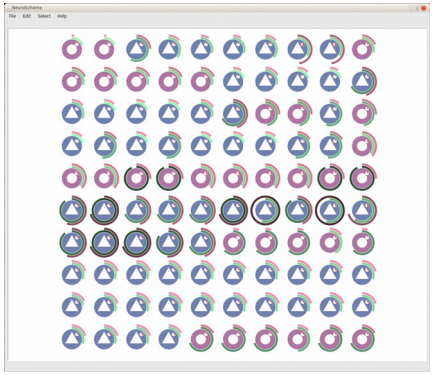

SP7 Other Areas

- Co-development Design Projects
  Rat & Human Brain Atlases, Neuromorphic integration
- Software Services
  NEST, Software Best Practices
- Analysis tools:
  Elephant
- Porting to HPC Architectures:
  NestMC multicompartment simulation code, HPC VirtualBrain
- Job Infrastructure:
  Dynamic Scheduling, Interactive Simulation
- Provenance Tracking
- System Architecture and Validation
- Visualization & Steering Simulations
- Numerical Methods

Thank you!

Forschungszentrum Jülich
- Jülich Supercomputing Centre
- SimLab Neuroscience
- Institute of Neuroscience and Medicine

RWTH Aachen University Virtual Reality and Immersive Visualization

Swiss Supercomputing Centre

Barcelona Supercomputing Centre

Cineca

Universidad Politécnica de Madrid

Universidad Rey Juan Carlos

École polytechnique fédérale de Lausanne

And many others...